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Knowledge management and creativity: a technology-facilitated balance

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KNOWLEDGE MANAGEMENT AND CREATIVITY:

A TECHNOLOGY-FACILITATED BALANCE

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Abstract

A growing body of literature discusses the importance of creativity in organizations. Together with the reliance of creativity on knowledge, and the increasing use of information systems (IS) as means to support organizational knowledge, research of the relationship between IS, knowledge and creativity in organizations seems to be in order. In this paper, evidence from case studies of real-world commercial creative processes is presented. Drawing on the evidence, the creativity, knowledge and IS literatures are critically examined. A view of channeled creativity is consequently presented and discussed that takes into account a cognitive perspective of creativity. This view focuses on flexible knowledge sharing, rather than on prescriptive creativity algorithms. This view involves primarily two complementary organizational practices: communication of exemplars and references, and knowledge restriction. Unlike many of the creativity support approaches presented in the literature, it is not an isolated technique but rather a set of fairly specific organizational practices, which, brought together, seem to give rise to creativity, and mitigate against potential identity conflicts.

Keywords: knowledge Management, creativity, creativity management, Organizational Information Systems

1 Introduction and background

Two related trends are evident in recent social sciences, management and technology literature: modern economies are seen as increasingly dependent on knowledge (e.g. Kogut & Zander 1992) and at the same time, knowledge is seen as an increasingly central concept in the understanding of firms and markets behavior– evident, for example, in the knowledge based theory of the firm (e.g. Grant 1996). At the same time, creativity, which is closely related to knowledge (Leonard & Sensiper 1998; Weisberg 1999), is seen as an important organizational capability (Amabile 1998; Mumford 2000), a possible source of organizational effectiveness (Woodman, et al 1993), and a source of competitive advantage (Leonrad & Straus 1997). Information systems (IS) support knowledge creation and sharing in organizations and much research has dealt with organizational knowledge management and the role IS play in it (Alavi & Leidner, 2001). The importance of creativity in organizations, the reliance of creativity on knowledge, the increasing use of IS as means to support organizational knowledge – all point to the importance of research on the relationship between IS, knowledge and creativity in organizations.

1.1 Knowledge in the management context

In recent years, literature on knowledge management has gained much influence in management research. Knowledge – so accepted wisdom (e.g. Lampel et al. 2000) has it – is advantageous. The more knowledgeable we are, the better we can be at what we do. Knowledge is also commonly said (e.g. Davenport et al. 1998) to be power. Much of the management literature on knowledge follows the work of Polanyi (1966; 1969), and a prominent distinction in the management and organization literature is made between Tacit knowledge and Explicit knowledge (Polanyi, 1966; 1969; Nonaka 1994). While Nonaka seems to draw on Polanyi's work, he often views tacit and explicit knowledge as two distinct categories. Such an approach ignores Polanyi's original view, and rather looks at the relations between them as dichotomous.

The focus of this research is the tacit/explicit and individual/social distinction levels. The motivation for this stems from the following: first, given the focus on the organizational context, Polanyi's (1966; 1969) view on the centrality of tacit knowledge to knowledge sharing seems to suggest that these aspects of knowledge are promising directions to pursue. Second, from a practical, managerial perspective, tacit knowledge is claimed to be underlying many competitive capabilities of companies (Leonard & Sensiper, 1998). The conversion (to explicit knowledge) and mobilization of tacit knowledge are viewed as the key to creating new knowledge (Nonaka, 1991; 1994) – knowledge which in turn may be shared and serve as a strategic resource of firms (Grant, 1996). Third, creativity involves knowledge that is highly tacit (e.g. Hackley, 2000). Fourth, while the importance of tacit knowledge is widely acknowledged in the management literature, the management of tacit knowledge is relatively unexplored - compared with that of explicit knowledge (Leonard and Sensiper, 1998).

1.2 Creativity and knowledge

In this paper, the following definitions of organizational creativity will be used - due to their influence on the management literature:

"The creation of a valuable, useful new product, service idea, procedure, or process by individuals working together in a complex social system" (Woodman et al, 1993);

"The production of novel and useful ideas by an individual or small group of individuals working together" (Amabile, 1988).

Creativity and knowledge are closely linked (e.g. Edmonds and Candy, 2002). Weisberg (1999) points to a dominant assumption in modern creativity research regarding a tension between knowledge and creativity: "Knowledge may provide the basic elements, the building blocks out of which are constructed new idea, but in order for these building blocks to be available, the mortar holding the old ideas together must be not too strong. Thus, while… one must have knowledge of a field if one hopes to produce something novel within it… too much experience can leave one in ruts, so that one cannot go beyond stereotyped responding. The relationship between knowledge and creativity is assumed therefore, to be shaped like an inverted U, with maximal creativity occurring with some middle range of knowledge" (1999:226).

Another view regarding the relationship between creativity and knowledge is that "although cases of insight do occur, more often than not creative thought calls for information acquisition and the selection of appropriate concepts for understanding this information" (Mumford, 2000). This, however, is not a trivial task. Reflecting the view that "a wealth of information creates a poverty of attention" (Simon, 1997:40), the attention of employees has become to be seen as a resource that has to be managed in the face of information overload (e.g. Davenport & Back, 2000).

Weisberg (1999) presents the "foundation view", an opposite approach to the inverted U shaped relationship, according to which knowledge is positively related to creativity, and so in order to reach a master level of expertise in a discipline, long periods of time need to be "spent internalizing what has

already been done in the discipline" (Weisberg 1999). Experts' knowledge is seen as beneficial as experts may reformulate, decompose, problems and thus reduce the size of the problem space. Weisberg concludes that while, in his opinion, the view of knowledge as potentially detrimental to creativity is flawed, it is still not clear how knowledge is used in new situations. He argues that if people in creative disciplines "did not know what had been done, they could not move significantly beyond it" (1999). This however, is not enough to explain why years of immersion are required, according to Weisberg, who admits that "little more than speculation can be offered concerning how knowledge is used during creative thinking" (Weisberg, 1999).

Such view, however, is not necessarily representative of creativity research, as various researchers to claim to construct an understanding of the inner workings of creativity and knowledge: Santanen et al. (2004), for example, present the *Cognitive Network Model of creativity* (CNM– see Figure 1), according to which human memory is represented in the mind as associations among related concepts, and bundles of associations, called frames, are linked together in a cognitive knowledge network. Working memory, in this view, is limited in capacity – although this limitation may be relaxed through chunking – the combination of frames, based on their similarity or frequency of association. The development of creative solutions, according to this view, is the result of a combination of frames (that may be activated by stimuli) from disparate areas of the knowledge network. Limited stimuli may activate familiar patterns of associations, and in order to mitigate against this, creative enhancing techniques may be used to introduce different types of stimuli. A related view is presented by Nagasundaram and Dennis (1993) who suggest a model of cognitive stimulation maps including various stimulus attributes (diversity, cardinality and temporal distance) of previously generated ideas. These are then presented to participants in electronic brainstorming in order to improve ideation.

The mechanism of Santanen et al's (2004:178-179) CNM of creativity (see Figure 1) is as follows:

Arrow 1: Conditions that increase the likelihood of forming new associations among previously unrelated frames increase the production of creative solutions.

Arrow 2: The likelihood of forming new associations between previously unrelated frames increases as the disparity among the frames in working memory increases.

Arrow 3: Cognitive load interferes with the ability to create associations among frames in working memory.

Arrows 4 + 5: Cognitive load increases as the number of stimuli to which problem solvers are exposed to per unit of time increases (arrow 4) and as the disparity among the currently active frames increases (arrow 5).

Arrow 6: When frames are simultaneously active in working memory, they may become chunked into larger frames. This chunking can serve to reduce cognitive load.

Arrow 7: Due to the combination of two or more frames, the process of chunking, is likely to reduce the overall diversity among currently activated frames.

Arrow 8: Simultaneously active frames that are highly diverse are not as likely to chunk as readily as frames that are more closely related.

Arrow 9: As the diversity of stimuli increases, the disparity among the active frames increases as well.

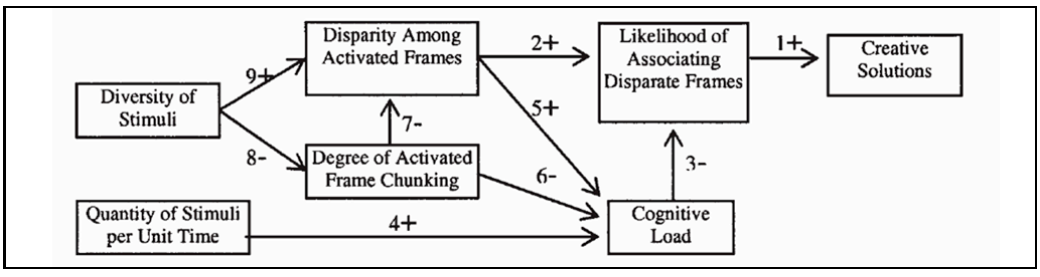

Figure 1. Cognitive Network Model of Creativity – causal linkages. Source: Santanen et al, 2004

1.3 The importance of exemplars

When re-examined in the context of knowledge, the views described above raise the question of how can one obtain knowledge of what is creativity and what is creative. This reflects a much more general issue addressed in the philosophy literature, regarding the nature of concepts. According to the classical theory of concepts "most concepts… have definitional structure… most concepts encode necessary and sufficient conditions for their own application" (Laurence & Margolis, 1999: 9). Therefore, when creativity is viewed this way, one is faced with the question of what are the necessary and sufficient conditions for creativity or for a creative work. The classical theory of concepts has been heavily criticized.

Two prominent alternatives are discussed in the literature (Gabora & Aerts, 2002): Drawing on Wittgenstein's rejection of formal criteria as giving rise to concepts in favor of family resemblance, Prototype Theory (e.g. Rosch & Mervis 1975) holds that concepts are represented by a set of characteristic, but not defining, features. An item can be categorized as an instance of the concept if it is similar to this prototype. Exemplar Theory (e.g. Medin, et al 1984), on the other hand, provides an alternative whereby rather than relying on a set of characteristics, a concept is represented by a set of instances of it stored in memory. The importance of exemplars in learning and categorization is highlighted in the psychology (Chi et al 1989; Pitt 1997) and management (e.g. Mumford, 2000) literatures, as well as in the context of creativity practice (Collins, 2004).

1.4 Creativity enhancement: stimuli and technology-facilitated support

Creative problems solving approaches in the management literature have been influenced by Simon (1960), whose approach maintains interaction between intelligence (recognizing the problem and analyzing of relevant information), design (generating possible solutions), and choice (selecting and implementing a solution). In a group context, Hender et al (2002) divide ideation techniques into four groups: Brainstorming – the most common form of ideation support used by practitioners (Hender et al, 2002); Techniques that provide stimuli in the form of multiple questions that deliberately direct the attention of thinkers to different aspects of the solution; Techniques that enable creators to explore associations between the problem and its causes, assumptions and attributes; Unrelated stimuli - introducing concepts during the creative process that are unrelated to the problem, and then linking them back to the problem as stimuli for ideation.

The literature on IS and creativity offers various, quite different, directions. However, although creative work relies on knowledge sharing and use, the literature on IS and creativity does not draw much on the knowledge management literature.

One direction of research involve Creativity Support Systems (CSS) which attempt to codify creativity techniques in order to support idea generation, primarily by relying on word stimuli, and use techniques such as providing access to databases of associations of topics, phrases, and words (Massetti 1996) or interlinked words (Malaga 2000). The CSS literature (e.g. Massetti, 1996 1998; Marakas & Elam 1997) focuses mainly on the level of the individual user, and employs experimental methods to examine the effect of dedicated creativity-enhancing software on users' creativity. Another related direction (e.g. Nunamaker et al 1987; Satzinger et al 1999; Hender et al 2002), focuses more on a group level collaboration, is the use of Group Support Systems (GSS) in facilitating group creative processes and collective idea generation. Thus, for example, GSS or EBS (electronic brainstorming systems) are said to enable group members to make anonymous contributions and simultaneous and this way to avoid evaluation apprehension, and contribute simultaneously and thus avoid Evaluation Apprehension - when people do not voice a what they think may be unpopular or partially formed idea in order to avoid negative reactions, and Production blocking – when only one person at a time may use an oral

communication channel and during this time others may forget their ideas. (Dennis, et al, 1988). According to Hender et al (2002), EBS "can be used to produce ideas of a higher quantity and quality than verbal Brainstorming" (2002:61).

1.5 Research issues

Following the above, this research aims to examine the nature of the relationship between creativity, knowledge and IS in an organizational context, while taking into account cognitive issues. More specifically, the questions addressed here are how is creativity managed and enhanced in a commercial (rather than artistic) ideation environment, and is the role of IS in this.

2 METHODOLOGY

Four case studies were carried out as part of the research, within two international advertising companies. The advertising industry is reliant on creativity and the production of creative output (e.g. Johar et al 2001), and is also seen as knowledge intensive (Roberts 2000). The companies will be referred to as Blue and Green, and their clients will be given pseudonyms for the same reason. The case studies were carried out in the London and New York offices of both companies. Each case involved 3-4 months of on-site non-participant observation of creative projects development. The cases provided an opportunity for deep immersion in the organizations, as access to premises, access to the internal computer network and emails distribution, together with office space in the agencies - close to the teams' space - were provided.

Through this access, it has been possible to follow not only team meetings and internal presentations, but also casual interactions and consultations between different team members. In addition, 67 semi-structured interviews were carried out with people in different roles in the companies, and internal documents and systems were examined.

The research adopts an interpretative, qualitative approach. The interpretive approach to IS research views reality and human knowledge of it as a social construction, where no 'objective' reality can be discovered and replicated, and thus, cannot be understood independent of the social actors that construct reality (e.g. Orlikowski & Baroudi, 1991). Accordingly, interpretive IS research aims at "producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context" (Walsham, 1993:4) and does not predefine dependent and independent variables (Klein and Myers, 1999).

3 FINDINGS

The following creative process took place, with minor differences, at all four organizations studied (see Figure 2). An advertising campaign typically begins with a client brief to the advertising agency's account management people (who are in charge of the day-to-day relationship with the client) and planning people (who have knowledge of the brand, the market and consumer behavior). The planners then supplement the information provided by the client with other information, for example, the results of an analysis of consumer perception of the briefed brand, using the agency's proprietary brand perception analysis information system. Other information may be obtained by relying on independent market and consumer behavior research – sometimes using the services of the agency's "Knowledge" or "Information" Center. Based on the knowledge available, the planners transform the client brief, together with research insights, into a creative brief, with which the creative team (called "the Creatives") can work.

The written brief often consists of a one-page document containing a relatively small and carefully screened part of the information available to the planners and account managers. In the case studies, for example, such information included segmentations of the target audience demography, transcripts and analysis of focus groups, results of surveys of consumers' attitudes to brands, and market analysis

reports. The brief conveys the essence of the strategy, some key data chosen by a planner, consumer insight and benefit, and sometimes "Thought Starters" - general ideas designed to suggest a direction for the creatives. A planner commented that the primary goal of the brief is to achieve good work from the creatives rather than to provide knowledge per se. According to interviewees, too much knowledge can "stand in your way", and therefore sometimes "the less you know the better" (a Creative). Similarly, it was said by another creative that "too much information can be damaging" because one may "get caught up in all the details".

Creative development work is usually carried out by teams of two creatives, often consisting of a copywriter and an art-director, who usually share an office space. Creatives usually have artistic training and rely on knowledge of aesthetic conventions, and of what is current, "cool", and stylish. In interviews, creatives stated that learning was achieved through doing, feedback from superiors, peers and experts outside the agency, observations of other creative work, and from observations of the world around them (e.g. what people wear TV shows), culminating in "osmosis" of creative knowledge, as one creative put it.

At this stage, a briefing session takes place, enabling questions and informal interaction between planners, account management people and creatives. In the briefing session, a Creative Director is often present. The Creative Director often reviews creative work before it is presented to people in the agency, and his/her involvement in the process is formal (reviews) and informal (casual meetings and consultations). Another function is Traffic people who monitor the creative development process. After the briefing session, the creatives are given anywhere between a few days to a few weeks to come up with creative ideas. In the case studies, informal interactions between account and planning people, and creatives occurred during the work on the briefs. In such interactions, additional information pertinent to emerging ideas was provided, and sometimes creatives "bounced off" developing ideas to see if they were "on strategy". A planner at Green London commented that in such informal interactions creatives tend to be less nervous and more accommodating than in formal creative reviews. Such informal interactions, which can take the form of face-to-face, phone, or email interaction, enable flexible knowledge sharing and enable planners to provide on-demand knowledge – when it is needed. Creatives said that they often seek inspiration by browsing through print and Internet-based sources such as trade and general publications, and Internet sites dedicated to exemplars of creative work. The creatives' deliverables (e.g. a TV script) are then examined by the creative director, and later by account management and planning people, before they are presented to the client.

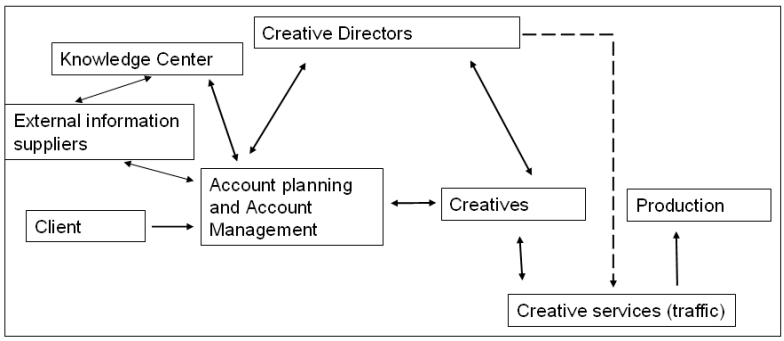

Figure 2: The creative process

3.1 IS in the creative process

Information and knowledge sharing: Information on market trends and consumer behavior was an important element of planners' work. This could be obtained from internal proprietary systems, external suppliers (e.g. Mintel, Gartner), by using proprietary systems or by communicating with local, regional or global information experts within the organization.

There were also a number of specific ways in which less targeted information was made available to creative teams. These included: Emails describing and providing examples of how different offices of the company came up with good creative solutions. This often included what was written about it in the trade or general media; Exemplars of praised good work were communicated through internal awards and publication (via emails) of the results of the competition together with explanations and guidelines; Similar content was communicated through the default entry screens to employees' email systems. These featured exemplars of creative work and some commentary, which was changed about once a month; TV monitors continually showing adverts were placed around the offices; TV scorecard – reporting consumer trends in terms of TV viewing; People's expertise in specific fields were often searched using an organization-wide email.

Project management and expertise locating: Project management systems were used primarily by traffic people to monitor progress of work and allocate people to new projects. Expertise Information was obtained by using email. (e.g. an email was circulated in the agency asking for people who worked in the past on certain health products).

Stimuli and inspiration support: Inspiration was said by creatives to often be supported by stimuli such as exposure to images or existing work, which were observed by browsing through offline trade and general publications, and to some degree dedicated external adverts repository websites. In this respect, inspiration and shared references to best practice were supported by online and offline information sources such as, emails, default entry screens, intranet or simply by having posters of agency ads hanging on the office walls. This way, a shared point of reference and common standards are reinforced indirectly, providing potential sources of inspiration. The internet, for example, was said by a creative at Green NY to be useful in the context of creative development. He gave an example of how he found information about alligators skin and related it to a creative development of an advert for a skin product. Email systems enabled people working on a project to exchange knowledge, in addition to, or instead of, meeting face to face. For example, a planner emailed an addendum to a brief after a briefing meeting, with additional information and insights.

Production and delivery: An artwork flow system provided a repository for work in progress, enabling people involved in the process to add notes and comments on work as it progresses (e.g. change size of graphic elements) in a way that is visible to all people involved. In one case, one of the deliverables was a catalogue containing tens of pages and hundreds of product shots. The artwork system, according to the project leader on behalf of the agency, was important in keeping track of the work that was distributed between a few designers, adding comments, sharing results with the client, and receiving feedback from the client. Systems such as graphic software and hardware, editing facilities and sound systems were used by creatives (or, in many cases, external suppliers with which that agency was working) to apply their skills by executing ideas such as scripts or visual ideas, and transforming them into deliverables, such as TV spots, print adverts, radio spots, which could be presented to other people, including clients. Creative documents were delivered by email, artwork flow systems, and FTP sites.

4 ANALYSIS AND DISCUSSION

4.1 Knowledge restriction and sharing

The process described above involves what may be seen as a knowledge restriction practice: The one-page brief document provided to the creatives contained only a small part of information available to the planners and account managers. Only a few highlights and Thought Starters, chosen by the planner as crucial to be conveyed in order to execute the strategy, were presented in the formal brief. Thus, the written brief for million-dollars worth of creative projects therefore consisted of only one page.

The reason for this knowledge restriction, according to a creative at Green NY, was that too much knowledge can "stand in your way", and therefore sometimes "the less you know the better". Similarly, it was said by a creative at Blue NY that "too much information can be damaging" because you can "get

caught up in all the details". A planner at Blue London suggested that one page brief was intended to prevent "noise" in the creative process. Thus, the knowledge restriction practice consists of the following: first, choice of which information to be used in the creative strategy formation may determine the scope of the ideation solution; second, the choice of which relevant knowledge should be passed on to the creatives as part of the brief, may also influence possible creative solutions; and third, the choice of Thought Starters may influence the direction of the creative development and therefore lead to scope restriction. The knowledge restriction, as well as the interviewees' view that beyond a certain degree knowledge transferred to them can be disadvantageous, runs counter some of the literature that suggests that organizations should seek to maximize knowledge flow and accumulation.

One way to view the restriction phenomenon is as a support to the view of the inverted U- shaped relationship between knowledge and creativity, whereby optimal creativity requires not too little and not too much creativity. However, viewed critically, such explanation runs into two main difficulties: first, the inverted U relationship view is challenged in the literature (e.g. Weisberg, 1999), and second, even if accepting to the inverted U relationship view, it seems useful to gain an understanding of what underlies this relationship. In what follows these concerns are addressed by considering categories of possible explanations.

The restriction enables balancing different knowledge types

The knowledge sharing instances observed appear to have consisted of multiple channels and means, and therefore the formal written brief provided to the creatives was just one stage in a broader process of knowledge sharing, of which some parts are informal. The written brief thus serves as an invitation to engage in an informal, interactive practice of knowledge sharing and exchange of ideas. Leonard & Sensiper (1998) and Leonard & Swap (1999) stress the role of social interaction in creative processes as enabling exploitation of different types of knowledge different actors possess. In this respect, the creative undertaking, which was said by interviewees to be dependent on informal social interactions – often between people of different roles (e.g. Creative and Planners) - seem to support earlier work on the importance of social infrastructure to effective cooperative work and knowledge sharing (Kelly & Jones 2001). Since the formal briefing document was very often followed by meetings and consultations in which additional knowledge was shared – often on informal basis - between creative, planners, and account management people, it is suggested here that the knowledge restriction practice may support the creative undertaking by promoting interactive, informal channels of knowledge sharing and collaboration.

Knowledge restriction - for better creativity management

The knowledge restriction can be seen as a useful practice for this purpose, providing a way to support creatives' attention management. Following the views highlighting importance of attention resources (e.g. Davenport & Back, 2000) and restricted idea generation as useful in preventing information overload (Grise & Gallupe 2000), knowledge restriction, which emphasizes the transfer of only what is seen as essential knowledge, may therefore be a way to focus creatives' attention resources. In addition, the view of knowledge restriction as beneficial may be supported by the views voiced by both creatives and planners that the brief should be "exciting" for the creatives, who in turn look in it for things that will "strike" them. Another related perspective might be that knowledge restriction supports a practice of knowledge sharing-on demand. One of the consequences of restricted briefing is that the sharing of knowledge is done in a more specific manner. Sharing knowledge this way may be more useful to creatives as they can explore unconventional ideas while drawing on knowledge that may have not been provided in the initial written creative brief. In this respect, it could be said that the development of creative ideas is not restricted by the initial knowledge provided. A flexible, iterative approach to knowledge sharing is useful to creatives as it enables checking ideas while in early stages of development, acting immediately on the knowledge gained. Thus knowledge-on-demand, can be viewed as an instance of "just-in-time delivery" of knowledge, (Davenport & Glaser 2002). In this context, a view of the brief

as providing stimuli might be considered. Seen by creatives and planners as a point of departure for ideation, the objective of a creative brief may be more about communicating a clear and relevant insight about the product, than attempting to encompass all relevant knowledge. Creatives have mentioned their need for relevant inspiration and their search for it when working on creative assignments. The importance of the brief is thus as a creative starting point, or an inspiration facilitator rather than as a knowledge repository, and the inclusion of "thought starters" in it is seen a way to address this need for relevant inspiration.

Seeming knowledge restriction is not really a restriction

Viewed within the broader context of a knowledge theory, the case studies' findings - which may seem as a knowledge restriction practice - may turn to be a way not to constrain knowledge but to provide it in a more applicable way. This perspective acknowledges the importance of the quality and relevance of knowledge rather than its quantity, and attempts to prevent possible situations where knowledge quantity may reduce its quality. The focus on applicability is seen by many as marking the difference between knowledge and information: knowledge management's goal, according to this view, is to transform information into knowledge (Sarvary 1999). Therefore, "to know a topic or a discipline is not just to possess information about it. It is the very human ability to use that information" (McDermott 1999). The role of apparent knowledge restriction practice, may thus be to do just that: provide "information that is relevant, actionable, and based… on experience" (Leonard & Sensiper 1998).

4.2 Knowledge balance

The organizational practices of knowledge restriction on the one hand and communication of exemplars and guidelines on the other seem to reflect two contrasting approaches: limiting knowledge versus expanding it. This tension reflects the tension in the literature regarding the relationship between creativity and knowledge. It is suggested here that this tension may underlie much of the creative processes observed. Thus, a model of knowledge balance is proposed here, whereby knowledge sharing consists of knowledge restriction on the one hand, and exemplar communication on the other (see Figure 4).

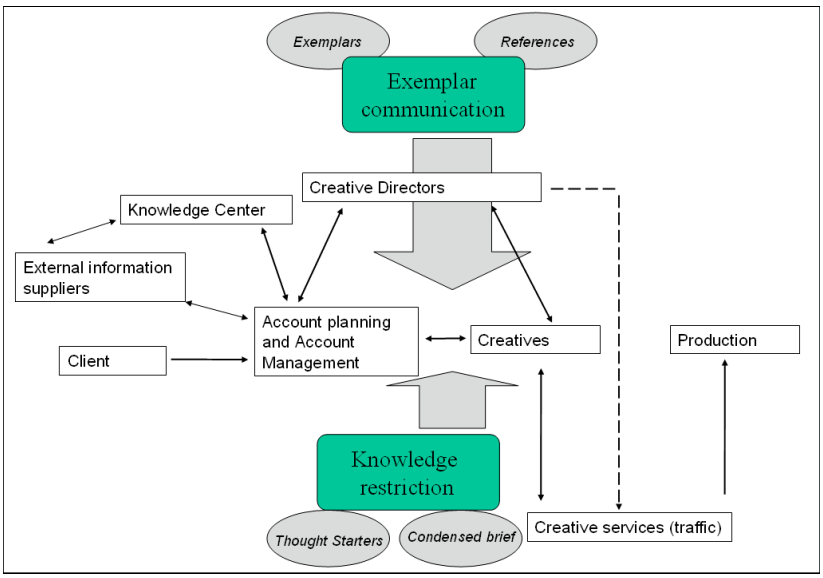

Figure 4. Restricted ideation through a balance of knowledge

Knowledge restriction and exemplar communication seem to balance each other in the following ways: The model seems to address the clash (Weisberg 1999) between the inverted U-shaped relationship view of knowledge and creativity, and the "foundation view". It presents a way of providing balanced, targeted, ideation related knowledge to creators, as it enables, on the one hand, a constant flow of new knowledge to be gained based on industry and company conventions communicated through exemplars and references, and on the other hand restrict – at least to some extent – knowledge deemed unnecessary for ideation (in the U-shaped relationship terms thus unnecessary knowledge might become damaging, representing the right-hand side of the inverted U). In particular, the knowledge balance view seems to address the difficulties presented by Luchins & Luchins (1959) and Frensch & Sternberg (1989) of dealing with changes in the environment: the ever-changing exemplar communication provides a way to immerse creative ideators in their discipline, while indirectly update them on changes in the environment. For example, the communication of updated recommended creative work may convey a sense of what is current in popular trends and artistic conventions.

It is also suggested here that the constant change in the exemplar and other stimuli provided to creatives may help to reduce the periods that should be "spent internalizing what has already been done in the discipline" (Weisberg 1999). Thus the combination of restricted 'hard' knowledge together with abundance of 'soft' knowledge may bridge the opposing views of knowledge and creativity, leading to an integrative view of ideation as a product of a balance of knowledge.

The proposed model supports the view that "introducing additional stimuli in addition to the problem statement and emerging pool of ideas can further increase creativity" (Hender et al, 2002). Thus, the integration provides a combination of both problem-related stimuli and unrelated stimuli (in the sense discussed by Hender et al, 2002). Viewed in the context of the CNM of creativity (Santanen et al, 2004), the balance of knowledge may contribute to ideation in the following ways (see Figure 5).

According to this view, exemplars may help "to deliver external stimuli to the problem solvers" (Santanen et al 2004), and therefore, may activate frames. Thus, diversity of stimuli may be enhanced with exposure to exemplars, while knowledge restriction may help in curbing cognitive load. This activation of two sources of influence may lead to a "combination of frames from disparate areas of the knowledge network" (Santanen et al 2004). Viewed critically, however, the restricted ideation influences on the CNM of creativity present only part of the picture: since the exemplars communicated are not merely random, but rather reflect a judgment by senior management on what is good creative work, the exemplars offer more than a contribution to the diversity of stimuli – they seem to offer a contribution to the stimuli's quality, which is not accounted for directly in the CNM. In addition, while according to CNM, similar stimuli may activate different frames in each individual creator case, control over stimuli (exercised in many cases through IS) may have effect on the direction the ensuing ideation – leading to some control of management on developing ideation.

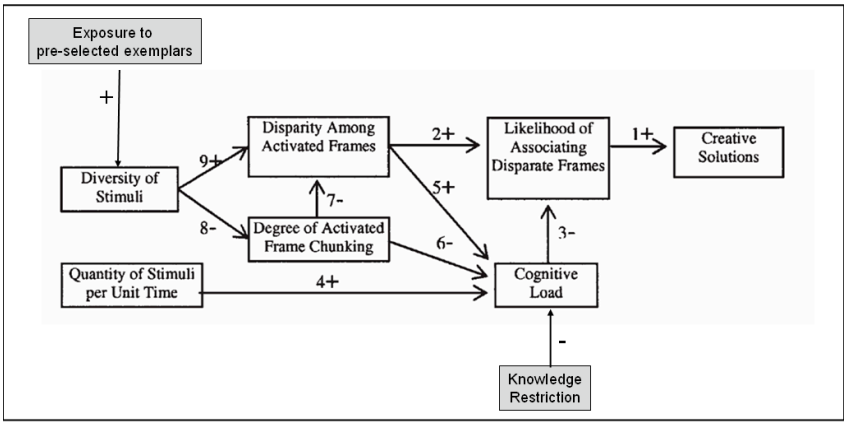

Figure 5. Cognitive Network Model of creativity and the balance of knowledge

5 CONCLUSIONS

A review of evidence from creative development case studies in light of the research literature on creativity and its cognitive underpinning, knowledge and IS, reveals a few discrepancies. More specifically, it seems that restricted ideation techniques recommended in the literature are not a common practice in a 'real world' ideation environment. An alternative view of restricted ideation is explored. It is reliant on a balance of knowledge, rather than on prescriptive creativity algorithms and involves two complementary organizational practices: communication of exemplars and references, and knowledge restriction. Ideation, in this view, takes place with no use of formal techniques. This may be more suitable to highly creative organizations given the strong sense of identity and high regard of originality in such organizations. Unlike other creativity support approaches presented in the literature, it is not an isolated technique but rather a set of fairly specific organizational practices, which, brought together, may give rise to creativity, and mitigate against potential identity conflicts. IS, according to this view, serve as essential platforms to both organizational practices.

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